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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/671,934	09/29/2003	Fred Gehrung Gustavson	YOR920030331US1	8288

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EXAMINER

DO, CHAT C

ART UNIT PAPER NUMBER

2193

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	04/16/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/671,934	Applicant(s) GUSTAVSON ET AL.	
	Examiner Chat C. Do	Art Unit 2193	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 March 2007 and 27 February 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 December 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>02/27/07</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. This communication is responsive to Amendment filed 03/19/2007.
2. Claims 1-20 are pending in this application. Claims 1, 9, 14, and 19 are independent claims. This Office Action is made final.

Drawings

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the limitations cited in independent claims, particularly streaming data from two of three matrices ...to a first matrix..., must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet"

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pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

4. Claims 8, 12, 17-18, and 20 are objected to because of the following informalities:

Re claim 8, the applicant is advised to rewrite the acronym "BLAS" in full for clarification. Claims 12, 17, and 20 have the same objection.

Re claim 18, it is missing a period (.) at end of the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Re claim 1, it is an incomplete claim since the claim has only a step of streaming data into cache which cannot be a method of executing linear algebra as intended in the preamble. Claims 9, 14, and 19 have the same rejection.

Re claim 18, the limitation "L1 cache" lacks of antecedence basis since the L1 cache has not mentioned previously. For examination purposes, the examiner considers the limitation as any cache.

Thus, claims 2-8, 10-13, 15-18, and 20 are also rejected for being dependent on the rejected based claims 1, 9, 14, and 19.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 1-20 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter.

Claims 1-20 cite a method for providing streaming data to a processor for processing. In order for claims to be statutory, the claims must accomplish a practical application or include a concrete, useful, and tangible result. That is the claimed invention must transform an article or physical object to a different state or thing, or produce a useful, concrete and tangible result. State Street, 149 F.3d at 1373-74, 47 USPQ2d at 1601-02. Also see "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility", OG Notices: 22 November 2005. However, claims 1-20 merely disclose steps of streaming data to cache without regarding to any particular practical application or a tangible result. In addition, claims 14-18 are directed to signal medium, which are clearly not statutory. Therefore, claims 1-20 are directed to non-statutory subject matter.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States:

10. Claims 1-6, 9, 14-15, and 18 are rejected under 35 U.S.C. 102(b) as being anticipated by Myszewski (U.S. 5,099,447).

Re claim 1, Myszewski discloses in Figure 5 a method of executing a linear algebra subroutine on a computer having at least one cache (e.g. abstract and col. 4 lines 55-64), method comprising: streaming data from two of three matrices involved in processing linear algebra subroutine to a first matrix such that submatrix data of two matrices residing in a higher level cache or in a memory is streamed to submatrix data of the first matrix residing in the cache (e.g. cols. 15-18 wherein in case whenever the first block is streamed down to the cache for processing, the other blocks as second and third block of matrices are still resided at the upper memory level), streaming providing data from higher level to data in the cache as required for processing for executing correctly the linear algebra subroutine (e.g. inherently for executing matrix multiplication in processor).

Re claim 2, Myszewski further discloses in Figure 5 at least one cache comprises an L1 cache and higher level comprises an L2 cache (e.g. col. 4 lines 55-64).

Re claim 3, Myszewski further discloses in Figure 5 selecting matrix of the three to be stored in cache by examining sizes and shapes of the three matrices (e.g. col. 4 lines 55-64).

Re claim 4, Myszewski further discloses in Figure 5 determining a size of each of first matrix, second matrix, and third matrix; determining which of first matrix, second matrix, and third matrix will fit into a size of cache; arranging elements of elements of first, second, and third matrices for streaming; and loading data for a selected one of first matrix, second matrix, and third matrix into cache (e.g. col. 4 lines 55-64 and codes cited in cols. 15-18).

Re claim 5, Myszewski further discloses in Figure 5 selecting a linear algebra subroutine from a plurality of subroutines to perform a matrix operation, selecting based on which of plurality of subroutine has a format consistent with matrix stored in cache (e.g. cols. 15-18 wherein the size of the block of matrix as submatrix is based on the cache size of resident), plurality of subroutines comprising six subroutines each capable of performing matrix operation using one matrix operand as being cache resident and a remaining two matrix operands as streaming through the cache from the higher level cache or memory (e.g. cols. 15-18 wherein the number of block for each processor is equate to six).

Re claim 6, Myszewski further discloses in Figure 5 data for second matrix and third matrix streams into L1 cache from L2 cache such that data from second matrix and third matrix streams in a vector format into the L1 cache (e.g. cols. 15-18 wherein the

selected portion of matrix as submatrix is streamed to the lower cache as L1 and other still resided in upper cache).

Re claim 9, it is an apparatus claim and has similar limitation as cited in claim 1. Thus, claim 9 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 14, it has similar limitation as cited in claim 1. Thus, claim 14 is also rejected under the same rationale as cited in the rejection of rejected claim 1.

Re claim 15, it has similar limitation as cited in claim 4. Thus, claim 15 is also rejected under the same rationale as cited in the rejection of rejected claim 4.

Re claim 18, it has similar limitation as cited in claim 6. Thus, claim 18 is also rejected under the same rationale as cited in the rejection of rejected claim 6.

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 7-8, 11-12, and 16-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Myszewski (U.S. 5,099,447) in view of Keenan et al. (U.S. 6,675,106).

Re claims 7-8, Myszewski fails to disclose linear algebra subroutine comprises a subroutine from a LAPACK (Linear Algebra PACKage) wherein the subroutine comprises a BLAS Level 3 routine or a BLAS L3 kernel routine. However, Keenan et al.

disclose linear algebra subroutine comprises a subroutine from a LAPACK (Linear Algebra PACKage) wherein the subroutine comprises a BLAS Level 3 routine or a BLAS L3 kernel routine (e.g. col. 6 line 52 – col. 7 line 40). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add linear algebra subroutine comprises a subroutine from a LAPACK (Linear Algebra PACKage) wherein the subroutine comprises a BLAS Level 3 routine or a BLAS L3 kernel routine as seen in Keenan et al.'s invention into Myszewski's invention because it would enable to highly efficient and optimize in solving system of linear equations in computer (e.g. col. 7 lines 1-40).

Re claim 11, it has similar limitation as cited in claim 7. Thus, claim 11 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 12, it has similar limitation as cited in claim 8. Thus, claim 12 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

Re claim 16, it has similar limitation as cited in claim 7. Thus, claim 16 is also rejected under the same rationale as cited in the rejection of rejected claim 7.

Re claim 17, it has similar limitation as cited in claim 8. Thus, claim 17 is also rejected under the same rationale as cited in the rejection of rejected claim 8.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Myszewski (U.S. 5,099,447) in view of Philip et al. ("PLAPACK: Parallel Linear Algebra Package Design Overview").

Re claim 19, Myszewski discloses in Figure 5 a method of providing a service involving at least one of solving and applying a scientific/engineering problem (e.g. abstract and col. 1 lines 18-45), method comprising at least one of: using a linear algebra software package (e.g. col. 1 lines 20-40) that performs one or more matrix processing operations (e.g. Figure 5), method (e.g. abstract and Figure 5) comprising streaming data for matrices involved in processing linear algebra subroutines such that data is processed using data for a first matrix stored in a cache as a matrix format (e.g. col. 4 lines 55-64) and data from a second matrix and a third matrix is stored in a memory device at a higher level than cache (e.g. col. 4 lines 55-64 and cols. 15-18 wherein the block is streamed to the cache from upper memory level one by one), streaming providing data from higher level in a manner as data is required for processing by streaming data from two of three matrices involved in processing the linear algebra subroutine to a first matrix such that submatrix data of the two matrices residing in a higher level cache or in a memory is streamed to submatrix data of the first matrix residing in the cache (e.g. in case whenever the first block is streamed down to the cache for processing, the other blocks as second and third block of matrices are still resided at the upper memory level); providing a consultation for solving a scientific or engineering problem using linear algebra software package (e.g. col. 3 lines 1-42). Myszewski fails to disclose transmitting a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result, and a printed version representing result; and receiving a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result,

and a printed version representing result. However, Philip et al. disclose a step of transmitting a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result, and a printed version representing result; and receiving a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result, and a printed version representing result (e.g. abstract and page 1 under the introduction section wherein the library is distributed to network processors for processing). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add a step of transmitting a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result, and a printed version representing result; and receiving a result of linear algebra software package on at least one of a network, a signal-bearing medium containing machine-readable data representing result, and a printed version representing result as seen in Philip et al.’ invention into Myszewski’s invention because it would enable high performance parallel computing (e.g. page 1 under introduction section).

14. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Myszewski (U.S. 5,099,447) in view of Philip et al. (“PLAPACK: Parallel Linear Algebra Package Design Overview”), as applied to claim 19, and in further view of Keenan et al. (U.S. 6,675,106).

Re claim 20, Myszewski in view of Philip et al. fail to disclose in Figure 5 matrix subroutine comprises a BLAS level 3 kernels or BLAS level 3 factorization kernels.

However, Keenan et al. disclose matrix subroutine comprises a BLAS level 3 kernels or BLAS level 3 factorization kernels (e.g. col. 6 line 52 – col. 7 line 40). Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention is made to add matrix subroutine comprises a BLAS level 3 kernels or BLAS level 3 factorization kernels as seen in Keenan et al.'s invention into Myszewski in view of Philip et al.'s invention because it would enable to highly efficient and optimize in solving system of linear equations in computer (e.g. col. 7 lines 1-40).

Response to Amendment

15. The amendment filed 03/19/2007 is objected to under 35 U.S.C. 132(a) because it introduces new matter into the disclosure. 35 U.S.C. 132(a) states that no amendment shall introduce new matter into the disclosure of the invention. The added material which is not supported by the original disclosure is as follows:

Re claim 1, the limitation "streaming data from two of three matrices" is not clearly found or supported in the original disclosure. Similar limitations are also existed in independent claims 9, 14, and 19.

Applicant is required to cancel the new matter in the reply to this Office Action.

Response to Arguments

16. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

- a. The applicant argues in page 11 last paragraph for claims rejected under 35 U.S.C. 101 that the cited claims do indeed have practical application and tangible result because its method improves DGEMM performance in two ways: "faster DGEMM kernel...via the use of faster DGEMM kernels".

The examiner respectfully submits that the current claim language does not include any improves DGEMM performance as cited in the argument. Clearly the independent claims just merely disclose a step of streaming data from upper memory to lower memory or vice versa, no practical application or useful and tangible result is seen or cited in the claims as alleged by the applicant.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a)..

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chat C. Do whose telephone number is (571) 272-3721. The examiner can normally be reached on M => F from 7:00 AM to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Meng-Ai An can be reached on (571) 272-3756. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Chat C. Do
Examiner
Art Unit 2193

April 11, 2007


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